The mines of Aspen were mainly discovered and opened by men whose most recent mining experience had been at Leadville, where the silver-ores were found principally at or near the contact of limestone, with overlying sheets of porphyry. The ores consist chiefly of lead and zinc sulphides, carrying silver, with a gangue of barytes, quartz and dolomite. Rich shoots of ore occur chiefly at the intersection of two or more faults, and the theory is advanced that while the minerals were deposited by hot waters, the solutions ascending along one of these channels were precipitated by solutions which circulated along the other.

The fundamental rock in the district is a granite, and this is overlaid by Cambrian, Silurian, Devonian, Carboniferous, Juratrias and Cretaceous. The Cambrian and Silurian formations are comparatively thin, and they consist largely of dolomitic sandstones and shales. The Devonian beds, which are very variable in character, comprise limestones and calciferous sandstones of no great thickness, and they are characterised by the presence of fishes of Devonian type. The Carboniferous and also the Secondary formations attain a great thickness. Into these strata, probably in Cretaceous times, there were intruded dykes of quartz-porphyry and diorite-porphyry. Great physical disturbances took place, accompanied by distinct systems of faults, some developed before, others after the deposition of the ores. In the author's opinion some faults have developed almost entirely in Post-Glacial times, the evidence resting partly on the preservation of scarps with slickensided fault-surfaces. He believes also that in many cases the fault-movement is going on at the present day. Since the beginning of the great disturbances, about 15,000 feet of sedimentary rocks have been removed by denudation; in later times by glacial action. A general ice-sheet at one time covered the whole of the Aspen district, leaving evidence of its presence in the rounded and fluted forms into which the hill-tops are carved, and in deposits of morainic material. When the ice-sheet shrank to smaller dimensions, there resulted local glaciers which followed the course of pre-existing valleys, and carved them into their present forms. At this period temporary lakes were formed by the damming up of glacial waters.

The author has given considerable attention to the subject of dolomitisation. He remarks that along the channels afforded by faults, hot spring-waters containing carbonate of magnesia rose and produced the dolomitisation of the limestone. Zones in the limestone following watercourses which are parallel to the bedding, or which cut across it, are locally altered to dolomite. There is evidence also of an earlier period of such chemical interchange, some of the Silurian and Carboniferous sediments having been early converted into dolomite by the action of magnesium salts contained in the waters of a great lake or inland sea, and in which they were concentrated by evaporation. These earlier dolomites are continuous over wide areas, with an almost uniform chemical composition.

Maryland Geological Survey.

Under the vigorous direction of the State Geologist, Prof. W. Bullock Clark, the Maryland Geological Survey has just issued its third volume; one of a series which in type and illustration is one of the most excellent of all the geological reports published in the United States. The present volume deals wholly with questions of economic geology treated from a scientific as well as a practical point of view. It is, in fact, a manual on road-materials and road-construction. The dependence of the highways upon the surface configuration of the land, and the bearing of the distribution of temperature and rainfall are pointed out. Attention is rightly paid to the relationship between the stony structure of the ground and the roads. The questions of construction and repair, and the qualities of road-metals are dealt with in detail, and the construction of sample roads is described. Various administrative matters are also dealt with. Illustrations are given of the method of road-making since early times; there are numerous photographic illustrations of types of roads formed of different materials, including types of bad roads in Maryland; and there are photo-micrographs of rock-sections of road-material.

Geology of Indiana.

A bulky volume of 1741 octavo pages forms the "Twenty-third Annual Report of the Department of Geology and Natural Resources for the State of Indiana," under the direction of Mr. W. S. Blatchley, State Geologist. It comprises the result of a careful survey of the coal area of Indiana, giving full details of the physical features and stratigraphy, of the mines and method of mining, with analyses of the coal. The work is profusely illustrated with maps and sections, and not the least interesting are the sections of faults and disturbances and evidences of irregularities in the coal-seams due to local thickening by disturbance, or to original deposition, or to erosion in Carboniferous or later periods. A report is made on the natural gas which occurs in the Trenton limestone, and is sealed up beneath the Utica shale. The first boring was made in 1884, and the gas was tapped at a depth of about 1100 feet. The Trenton limestone was proved to be both the source and the reservoir of the gas.

Geological Survey of Canada.

The "Annual Report of the Geological Survey of Canada for the year 1897 (1899)" has just reached us. It is a composite volume, containing six individual reports separately paged, but all indexed together with special references to each. As the progress of the survey has been noticed already in NATURE, when dealing with the Annual Summary Reports of the director, Dr. G. M. Dawson, it will suffice to call attention to this important volume which contains detailed accounts of Archæan, Palæozoic and Pleistocene deposits, with full descriptions of the economic products. There is a special report on the mineral resources of New Brunswick, by Mr. L. W. Bailey, and another on mineral statistics and mines, by Mr. E. D. Ingall. The volume is illustrated by a number of maps and plates. One of the most effective views is that of the Devil's Rapids on Chandière river, Quebec. It illustrates a report on the surface geology and auriferous deposits of South-eastern Quebec, by Mr. R. Chalmers.

ELECTRO-CULTURE.

THE results obtained by culture under the influence of electric light are fairly well known, and the growing of lettuce for salads, in spacious greenhouses with the aid of electric light, is already a profitable industrial pursuit in the United States (near Chicago and elsewhere). However, the use of electric currents for stimulating vegetation, although it was studied more than fifty years ago (by Ross, in 1844–46; continued by Forster, Sheppard, Fichtner, &c.), still remains unsettled. A communication upon this subject, made by a Russian engineer, V. A. Tyurin, before the St. Petersburg Electro-Technical Society, contains some welcome information upon the work done in this direction in Russia by M. Spyeshneff and M. Kravkoff. The former experimented a few years ago on three different lines. Repeating well-known experiments on electrified seeds, he ascertained once more that such seeds germinated more rapidly, and gave better fruit and better crops (from two and a half to six times higher), than seeds that had not been submitted to preliminary electrification. Repeating next the experiments of Ross—that is, burying in the soil one copper and one zinc plate, placed vertically and connected by a wire, he found that potatoes and roots grown in the electrified space gave crops three times heavier than those which were grown close by on a test plot; the carrots attained a quite unusual size, of from ten to twelve inches in diameter. Spyeshneff's third series of experiments was more original. He planted on his experimental plot, about ten yards apart, wooden posts provided at their tops with metallic aigrettes connected together by wires, so as to cultivate his plants under a sort of network of wires. He obtained some striking results, one of which was that the growth and the ripening of barley were accelerated by twelve days. Quite recently M. Kravkoff undertook a series of laboratory experiments upon boxes of soil submitted to electric currents. The temperature of the soil was raised by these currents; its moisture decreased first, but began to increase after a course of three weeks (the same increase of moisture was also noticed by Fichtner); and finally, the amount of vegetable matter in the soil was increased by the electric currents. With what is now known upon the influence of micro-organisms upon vegetation, further research on similar lines is most desirable and very promising.

SCIENTIFIC SERIALS.

THE *Journal of the Royal Microscopical Society* for April contains the President's Annual Address, the last instalment of his valuable series of addresses on the mathematics of the construction of microscopic lenses. In this address, Mr. E. M. Nelson devotes himself to the aplanatic immersion front and the Huyghenian eye-piece, and deals with the errors of this lens, viz. chromatism, curvature of image, distortion, and astigmatism.

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A new feature in the present number is the extension of the bibliography to microscopical technique and bacteriology.

THE *Journal of Botany* for February, March, and April contains several articles of more than usual interest. Mr. C. R. P. Andrews records the discovery in the Channel Islands of two grasses new to Britain, *Phalaris minor* and *Milium scabrum*, both apparently native; and Mr. Arthur Bennett, the occurrence of *Potamogeton rutilus*, also new to Britain, in Surrey. Dr. A. B. Rendle reviews the British species of *Naias*, now amounting to four (including one found at present in geological deposits only), although the first discovery of the genus as British was as recent as 1850. The very useful review of the algological literature for 1899 will, we hope, be continued in future numbers.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 5.—"Further Note on the Influence of Temperature of Liquid Air on Bacteria." By Allan Macfadyen, M.D., and S. Rowland, M.A. Communicated by Lord Lister, P.R.S.

In a previous communication (*Roy. Soc. Proc.* February 1, 1900) it was shown that no appreciable influence was exerted upon the vital properties of bacteria when exposed for 20 hours to the temperature of liquid air (−183° C. to −192° C.). Further experiments have since been made in which the organisms were again exposed to the temperature of liquid air for a much longer period, viz. seven days.

The organisms employed were *B. typhosus*, *B. coli communis*, *B. diphtheriae*, *B. proteus vulgaris*, *B. acidi lactici*, *B. anthracis* (sporing culture), *Spirillum cholerae asiatica*, *Staphylococcus pyogenes aureus*, *B. phosphorescens*, a Sarcina, a Saccharomyces, and unsterilised milk.

Instead of being exposed as formerly on the actual media in which they were growing, the organisms were submitted to the cooling process in the form of a broth emulsion in hermetically sealed fine quill tubing. This allows of complete immersion, and effects a considerable economy in the amount of liquid air used, besides greatly facilitating manipulation. The liquid air was kindly furnished by Prof. Dewar, and the experiment was conducted in his laboratory.

In the course of the experiment, the loss by evaporation of the liquid air was made up by adding fresh portions from time to time. In this way the temperature of about −190° C. was maintained uninterruptedly through the whole period of the experiment. At the same time considerable care had to be taken in conducting the first cooling, in order to avoid fracture of the quill tubes. A preliminary cooling was therefore effected by means of solid CO_2. After the expiration of a week, the tubes were removed with cork-tipped forceps, and placed in a strong glass vessel till thawing was complete. The tubes were then opened, and the contents transferred to suitable culture media. In each case, a direct microscopical examination was made to detect any possible structural changes.

It is a remarkable fact that, notwithstanding the enormous mechanical strain to which the organisms must have been exposed, a strain far exceeding in amount any capable of being produced hitherto by direct mechanical means, not the slightest structural alteration could be detected.

The sub-cultures made at the conclusion of the experiment grew well, and in no instance could any impairment in the vitality of the organisms be detected. In one or two instances only, growth was slightly delayed, an effect which might have been due to other causes. The photogenic bacteria grew and emitted light, and the samples of milk became curdled.

The above experiments show that bacteria can be cooled down to −190° C. for a period of seven days without any appreciable impairment of their vitality.

It has not yet been possible to undertake the experiments with liquid hydrogen.

Geological Society, April 4.—J. J. H. Teall, F.R.S., President, in the chair.—Additional notes on some eruptive rocks from New Zealand, by Frank Rutley. The author suggests a comparison of certain ancient rhyolites of Great Britain with those of New Zealand affected by solfataric action. As to the causes which may convert a glassy into a lithoidal rhyolite, we still seem to lack information: it is possible that the action of steam may be instrumental in effecting such a change, but this is probably only an occasional agent, and the more general cause of such changes must be sought elsewhere.—On the discovery and occurrence of minerals containing rare elements, by Baron A. E. Nordenskiöld. The first mineral referred to is scheelite, and the next cerite, which contains no less than four rare metals. The incandescent light produced when the latter mineral is fused with charcoal-powder was first observed by Cronstedt in 1751. The discovery of glucina, lithia, selenium and yttria is next referred to. Minerals containing yttria and oxides related to it were, at one time, thought to be almost limited to certain pegmatite-veins running in a broad zone on both sides of the 60th parallel of latitude. Latterly, fluocerite, orthite and gadolinite have been found in Dalecarlia; and among these minerals Benedicks discovered a silicate of yttrium containing 1·5 per cent. of nitrogen and helium. The author discovered kainosite, a silico-carbonate of yttrium and calcium, among minerals from Hitterö; and the same mineral was subsequently discovered in the flucan, fissures, and drusy cavities at the Nordmarken mines. The last-mentioned discovery and others related to it appear to suggest that the mode of formation of fissure-minerals is not so unlike that of the pegmatite-veins of the primary rocks as is generally supposed. Thorium, discovered by Berzelius in 1829, was originally obtained from the rich mineral-locality of Langesund (called Brevig in mineralogical literature), but it has since been recorded from other localities, including Arendal and Finnish Lapland. It is now obtained from the monazite-sand of rivers in the Brazils and South Carolina. Thorite contains about ·5 per cent. of inactive gas, probably a mixture of nitrogen and helium; but the latter element was first obtained from the mineral cleveite, also containing thorium, discovered by the author in 1877. Other minerals bearing nitrogen, argon or helium are referred to; and under the head of minerals bearing tantalum, mention is made of Giesecke's discoveries in Greenland. Among these is fergusonite, one of the richest sources hitherto known for obtaining that mysterious gas, or mixture of gases, which on our planet seems to be almost exclusively confined to minerals containing rare earths. "The group of earths, as well as the group of gases, of which we are here speaking, might, therefore, be compared with certain genera among organic beings, whose species, having not yet fully differentiated, offer to the descriptive zoologist or botanist difficulties analogous to those with which chemists meet in endeavouring to separate the rare earths and rare gases."

PARIS.

Academy of Sciences, April 9.—M. Maurice Lévy in the chair.—Funeral orations on the late M. Joseph Bertrand, delivered by MM. Jules Lemaitre, Maurice Lévy, Berthelot, Gaston Darboux, A. Cornu, Duclaux, Gaston Paris, and Georges Perrot.—On the transmission of the radiation of radium through substances, by M. Henri Becquerel. In order to ascertain whether the rays transmitted through a screen are transformed rays from the radio-active source or secondary rays emitted by the screen, experiments were made on the shadow cast by a body placed on the side of the screen opposite to the source. It appears that part, at least, of the secondary radiation is not deviated in a magnetic field, as is the case with the radiation of radium, whilst another portion is possibly due to partial diffusion. The absorption of the incident radiation increases with the distance of the screen from the source, as has been previously observed.—On the density and analysis of sulphur perfluoride, by MM. H. Moissan and P. Lebeau. The density of the gaseous perfluoride of sulphur, the preparation of which was described in a previous communication, is found to be 5·03, compared with air. The analysis of the compound was effected by decomposing it by the vapour of sodium at a red heat, a mixture of sodium sulphide and fluoride being thus obtained, and also by heating with sulphur or selenium in glass vessels and measuring the volume of the silicon fluoride evolved. The results are in accordance with the formula SF_6, the hexavalent character of sulphur being thus clearly demonstrated.—On the fossil ferns of coal, by M. Grand' Eury. A description of the roots of the various species of ferns occurring in the fossil forests of the coal beds at Saint-Étienne.—Immunity against symptomatic carbuncle after the injection of preventive serum and natural virus, either separately or together. Experiments with sheep show that complete immunity is produced by successive inoculation with serum and virus, but not by the

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